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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/008,853	11/16/2001	Wusheng Yin	INDUM-108XX	5092

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EXAMINER

ZARNEKE, DAVID A

ART UNIT PAPER NUMBER

2827

DATE MAILED: 10/02/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/008,853

Applicant(s)

YIN ET AL.

Examiner

David A. Zarneke

Art Unit

2827

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other: ____

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 11 recites the limitation "the connection bumps" in line 6. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Capote et al., US Patent 6,121,689 and Gilleo et al., US Patent 6,228,678.

Capote teaches a method of making a flip chip package comprising:

- a) dispensing an encapsulant (39) onto a substrate (20);
- b) dispensing solder balls (14) onto a chip (10) and coat with a thermosetting (13, 21+) adhesive flux (37), which in one embodiment can optionally containing filler, therefore meaning no fillers are required (12, 3+);
- c) aligning and mating the solder balls with substrate bond pads (12);
- d) reflowing the solder balls; and

e) curing the encapsulant (9, 19-63).

Capote fails to teach flux deposition upon the chip using a dipping process.

Gilleo teaches an underfilled flip chip having solder bumps coated with a flux (abstract), wherein the flux is coated upon the entire surface (9, 24+) and can be applied using a dipping process (8, 58+).

Therefore, the examiner takes "official notice" since the use of a dipping process to deposit a flux, as taught by Gilleo, is a notoriously well-known in the art flux coating technique (MPEP 2144.03).

Regarding claims 2 and 3, the performing of steps either by a machine or by hand is an obvious matter of design choice. Design choices are generally recognized as being within the level of ordinary skill in the art (MPEP 2144.04(d)). It is common knowledge that either man or machine can perform some of these steps.

With respect to claims 4 and 5, Capote teaches that the encapsulant (39), i.e. the underfill, can contain little or no filler materials (9, 30-31).

As to claims 6-8, it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the viscosity of the flux in relation to the viscosity of the underfill (MPEP 2144.05(b)).

Regarding claim 9, it would have been obvious to one of ordinary skill in the art at the time of the invention to reverse steps a) and b) because they are independent of each other. The order in which the underfill is placed upon the substrate and the flux is placed upon the chip is not important to the invention. They can be performed one

Art Unit: 2827

before the other, in any order, or even simultaneously and not materially affect the invention.

With respect to claim 10, Capote teaches performing the reflow and curing steps simultaneously (9, 56+).

Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Capote et al., US Patent 6,121,689 and Gilleo et al., US Patent 6,228,678.

Capote teaches a method of making a flip chip package comprising:

- a) dispensing an encapsulant (39) onto bond pads (12) of a substrate (20);
- b) dispensing solder balls (14) onto a chip (10) and coat with a thermosetting (13, 21+) adhesive flux (37);
- c) aligning and mating the solder balls with the bond pads;
- d) reflowing the solder balls; and
- e) curing the encapsulant (9, 19-63).

Capote fails to teach flux deposition upon the chip using a dipping process.

Gilleo teaches an underfilled flip chip having solder bumps coated with a flux (abstract), wherein the flux is coated upon the entire surface (9, 24+) and can be applied using a dipping process (8, 58+).

Therefore, the examiner takes "official notice" since the use of a dipping process to deposit a flux, as taught by Gilleo, is a notoriously well-known in the art flux coating technique (MPEP 2144.03).

Regarding claim 12, it would have been obvious to one of ordinary skill in the art at the time of the invention to reverse steps a) and b) because they are independent of

each other. The order in which the underfill is placed upon the substrate and the flux is placed upon the chip is not important to the invention. They can be performed one before the other, in any order, or even simultaneously and not materially affect the invention.

With respect to claim 13, Capote teaches performing the reflow and curing steps simultaneously (9, 56+).

Claims 1-3 and 6-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al., US Patent 6,365,435 and Kirsten, US Patent 6,367,150.

Wang teaches a method of producing a flip chip package comprising:

- a) dispensing underfill (5) on a substrate (10) having conductors (25);
- b) providing a chip (40) having bumps (45) thereon;
- c) placing the bumped die upon the underfilled substrate;
- d) reflowing the bumps; and
- e) curing the underfill (Figure 4 & 3, 59+).

Wang fails to teach 1) the application of a flux to the bumps; and 2) performing said application using a dipping process.

Kirsten teaches a solder flux compatible with underfill material comprising depositing a thermosetting polymer flux, wherein fillers are not required (9, 38+), upon solder balls using a dipping process (2, 8+).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the thermosetting polymer flux applied to bumps by dipping as taught by Kirsten in the invention of Wang because Kirsten teaches that the use of a

Art Unit: 2827

thermosetting flux cleans oxides from metal surfaces, also the flux residue does not inhibit the flow of the underfill, and the thermosetting residue of the flux increases the adhesion strength of the flux to the underfill which prevents delamination (abstract).

Regarding claims 2 and 3, the performing of steps either by a machine or by hand is an obvious matter of design choice. Design choices are generally recognized as being within the level of ordinary skill in the art (MPEP 2144.04(d)). It is common knowledge that either man or machine can perform some of these steps.

With respect to claims 6-8, it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the viscosity of the flux in relation to the viscosity of the underfill (MPEP 2144.05(b)).

As to claim 9, it would have been obvious to one of ordinary skill in the art at the time of the invention to reverse steps a) and b) because they are independent and separate of each other. The order in which the underfill is placed upon the substrate and the flux is placed upon the chip is not important to the invention. They can be performed one before the other, in any order, or even simultaneously and not materially affect the invention.

Regarding claim 10, Wang teaches performing the reflow and curing steps simultaneously (4, 35+).

Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al., US Patent 6,365,435 and Kirsten, US Patent 6,367,150, as applied to claim 1 above, and further in view of Gilleo, US Patent 6,228,678.

Wang and Kirsten, relied upon as taught above, both fail to teach the use of filled or unfilled underfill materials.

Gilleo teaches an underfilled flip chip wherein the use of filled or unfilled underfill materials are taught as being known in the art (1, 61-2, 13).

Therefore, the examiner takes "official notice" since the use of filled or unfilled underfill materials is notoriously well-known in the art (MPEP 2144.03).

Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al., US Patent 6,365,435 and Kirsten, US Patent 6,367,150.

Wang teaches a method of producing a flip chip package comprising:

- a) dispensing underfill (5) on a substrate (10) having conductors (25);
- b) providing a chip (40) having bumps (45) thereon;
- c) placing the bumped die upon the underfilled substrate;
- d) reflowing the bumps; and
- e) curing the underfill (Figure 4 & 3, 59+).

Wang fails to teach 1) the application of a flux to the bumps; and 2) performing said application using a dipping process.

Kirsten teaches a solder flux compatible with underfill material comprising depositing a thermosetting polymer flux, wherein fillers are optional (9, 38+), upon solder balls using a dipping process (2, 8+).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the thermosetting polymer flux applied to bumps by dipping as taught by Kirsten in the invention of Wang because Kirsten teaches that the use of a

Art Unit: 2827

thermosetting flux cleans oxides from metal surfaces, the flux residue does not inhibit the flow of the underfill, and the thermosetting residue of the flux increases the adhesion strength of the flux to the underfill which prevents delamination (abstract).

As to claim 12, it would have been obvious to one of ordinary skill in the art at the time of the invention to reverse steps a) and b) because they are independent of each other. The order in which the underfill is placed upon the substrate and the flux is placed upon the chip is not important to the invention. They can be performed one before the other, in any order, or even simultaneously and not materially affect the invention.

Regarding claim 13, Wang teaches performing the reflow and curing steps simultaneously (4, 35+).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Wang et al., US Patent 6,168,972 (Figure 9A & 9B), is cited as teaching the state of the art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David A. Zarneke whose telephone number is (703)-305-3926. The examiner can normally be reached on M-F 10AM-6PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L. Talbott can be reached on (703)-305-9883. The fax phone numbers for the organization where this application or proceeding is assigned are (703)-

Application/Control Number: 10/008,853

Page 9

Art Unit: 2827

308-7722 for regular communications and (703)-308-7721 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-308-0956.

David A. Zarneke
September 26, 2002

David A. Zarneke
AV 2827